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Stress Analysis and Care Prediction using IOT and Thing Speak

V. A. Aher, Dale Anjali, Dharam Shraddha, Thorat Ishwari
Department of Electronics & Telecommunications Engineering,
Pravara Rural Engineering College, Loni, Maharashtra, India

Abstract*: We have developed a stress analysis system to accurately detect the stress level of the person. The stress care industry has embraced information and communication technologies, especially with recent advancements like the Internet Of Things (IoT). Hospitals are now using mobile devices connected through IOT and Wi-Fi for efficient communication among medical professionals and staff. This paper introduces a new approach to leverage IOT in healthcare, emphasizing improved services through mobility. stress care methods within IOT, It covers various stress care methods such as wireless monitoring, U-Stress care, and age-friendly stress care. The proposed system outlines a comprehensive monitoring cycle and an effective stress analysis system using IOT. The experimental results demonstrate its reliability during different medical emergencies. The system combines microcontrollers with sensors for collecting data, IOT for analyzing data, and Thing Speak for visualizing data.*

Keywords: stress analysis, healthcare, IOT, Thing Speak

I. INTRODUCTION

In the fast-paced modern lifestyle, stress has become increasingly prevalent, impacting both physical and mental well-being. Identifying its sources, often rooted in work, home, or societal environments, proves challenging. The body's responses to stress can be categorized as physiological (such as the 'fight or flight' response) or behavioral (including defensive and expressive behaviors). Stress is broadly classified into Acute and Chronic types. Acute stress is a short-term response, allowing the body to return to equilibrium swiftly. In contrast, Chronic stress persists, potentially leading to various health issues like diabetes, hypertension, and mental health problems. Recognizing stress levels, especially in patients like those with cancer or cardiovascular issues, is crucial. Chronic stress can activate cancer cells and accelerate tumor growth, while in cardiovascular patients, it may elevate blood pressure, posing risks to recovery. The primary objective of this project is to develop a continuous stress monitoring system, mitigating the adverse effects on mental and physical health. Physiological parameters like Heart Rate (HR), Temperature, and Pulse are considered, with the 10T platform "Thing Speak" being utilized. Users need an authenticated account to store and receive data on Thing Speak, where MATLAB applications like 'MATLAB Analysis' and 'MATLAB Visualization' facilitate
data analytics. This proposed system allows for real-time stress monitoring, offering valuable insights for early intervention

II. LITERATURE REVIEW AND OBJECTIVE

This section shows the significant work done on stress, its categories, and its circumstances. Numerous psychological parameters including blood pressure, body temperature, ECG data, etc. are used to evaluate and analyze the stress level of a person.

[1]"STRESS LEVEL PREDICTION SYSTEM INTERFACED WITH IOT" February 2019 in this paper authors Sugapriya, Revathi, and Saranya endorse how to develop a wearable system for measuring and analyzing stress levels.Mainly focused on developing a wearable system.In this, they used different types of sensors such as GSR, BPM, Heart Rate, etc.

[2]"STRESS DETECTION USING ARDUINO" March 2020 in this paper authors Prof. Pranil Jain, and Elton Alphonso used sensors to measure the stress extent of a person being known to be stressed. Stress escorts negative upshots such as decreased level of concentration, increase in tumor cells, increase in cancer cells anxiety, and

depression. This system is used to spread cognizance about stress among users and help to manage their stress states and do what is needed to improve their health.

III. MATERIALS AND METHODS

Select appropriate sensors and components for measuring heart rate, body temperature, and ECG data. Interface the sensors with the Arduino microcontroller to acquire real-time data. Design and assemble the hardware system to ensure accuracy and reliability. Program the Arduino to continuously read data from the sensors.

Implement filtering and signal processing techniques to ensure data accuracy and reliability. Store the collected data in suitable data structures within the microcontroller. Develop a user-friendly display interface to visualize real-time data. Utilize suitable display modules to present heart rate, body temperature, and ECG data. Ensure that the interface provides easy navigation and interpretation of data. Implement algorithms for ECG data calculation.Display the ECG waveform on the user interface for real-time assessment. Ensure that the ECG data is accurate and representative of the individual's cardiac health. Select a cloud platform for data storage and analysis (e.g., AWS, Google Cloud, or a custom solution).Program the Arduino to securely transmit data to the chosen cloud platform.

Implement access controls and data encryption to protect sensitive health information.

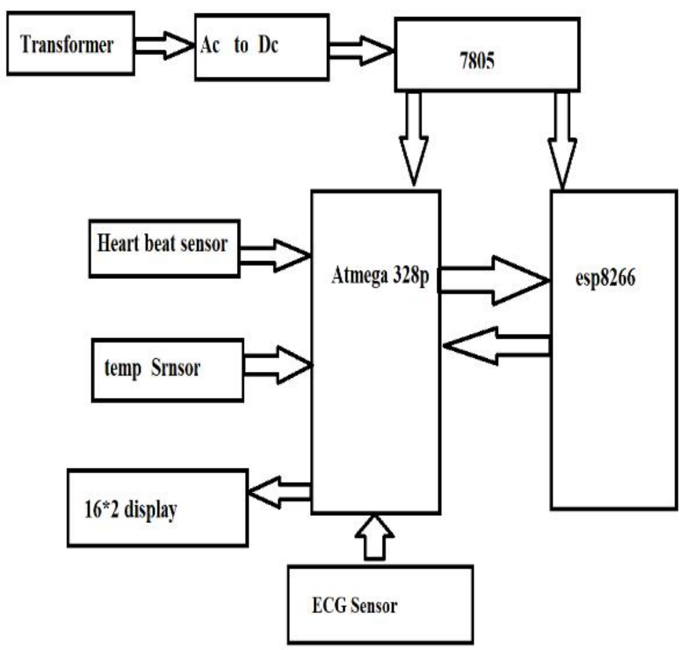


Fig 1.1 Block diagram

The system comprises a power supply block for a stable 5V output, utilizing a transformer and AC-to-DC converter. An Arduino Atmega 328p microcontroller processes data from stress, heart rate, temperature, and ECG sensors. A 16x2 LCD display shows the measured values. The cloud platform, facilitated by an ESP8266 WiFi module, stores and analyzes data collected by the sensors.

The Arduino microcontroller acts as the core component of the system, responsible for gathering data from various sensors and performing calculations to derive stress levels, heart rate, temperature, and ECG signals, which are then showcased on the LCD.

The GSR sensor detects changes in skin conductivity, influenced by sweat production regulated by the sympathetic nervous system during stressful situations. It communicates with the Arduino microcontroller through two analog pins.

Meanwhile, the ECG sensor measures heart muscle electrical activity and interfaces with the Arduino microcontroller via three analog pins. The circuit diagram illustrates the connection setup, including the LCD for data visualization.

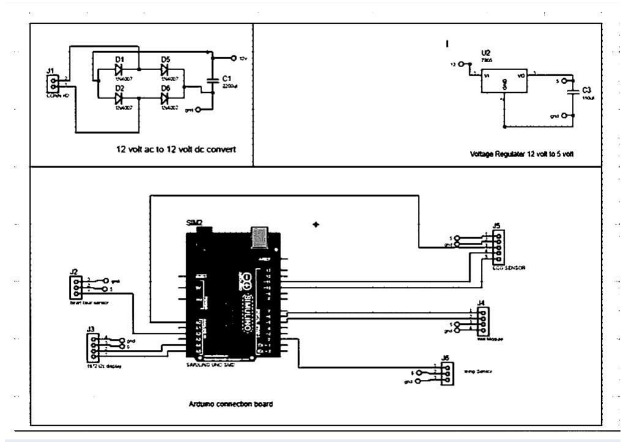


Fig 2. Circuit Diagram

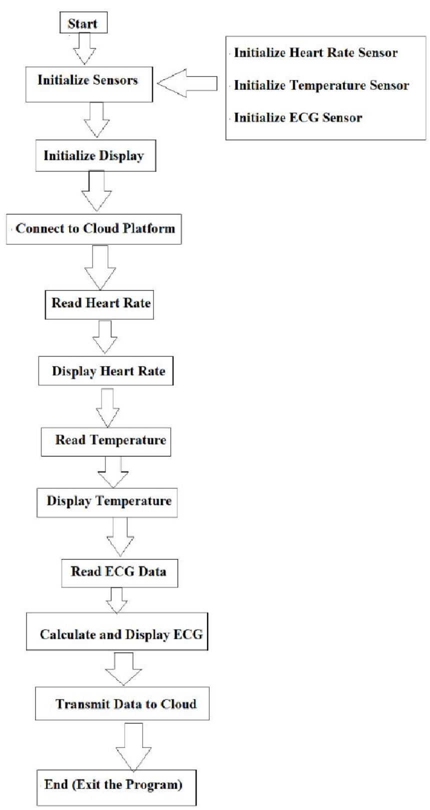
Here's a breakdown of the circuit's functionality:

1. The Arduino microcontroller reads voltage outputs from the ECG sensor.
2. Using these readings, it computes stress levels, heart rate, temperature, and ECG signals.
3. The Arduino then showcases these computed values on the LCD.

Powering the circuit is achieved through a 5V power supply connected to the Arduino microcontroller via the VIN and GND pins.

Programming the circuit is facilitated by the Arduino IDE, a software tool enabling users to write and upload programs onto the Arduino microcontroller.

IV. FLOW OF PROCESS



1) Initialization:

- Initialize the system.
- Initialize sensors (Heart Rate, Temperature, ECG).
- Initialize the display module.
- Connect to the chosen cloud platform for data transmission and storage.

2) Main Loop (Continuous Operation):

- Enter the main loop for continuous operation.
- Read heart rate data from the heart rate sensor.
- Read body temperature data from the temperature sensor.
- Read ECG data from the ECG sensor.

3) Display Data

- Display the heart rate on the user interface.
- Display the body temperature on the user interface.
- Calculate and display the ECG waveform on the user interface.

4) Data Transmission to Cloud:

- Securely transmit heart rate, body temperature, and ECG data to the cloud platform.
- Implement data encryption and access controls for security.

5) Repeat Loop

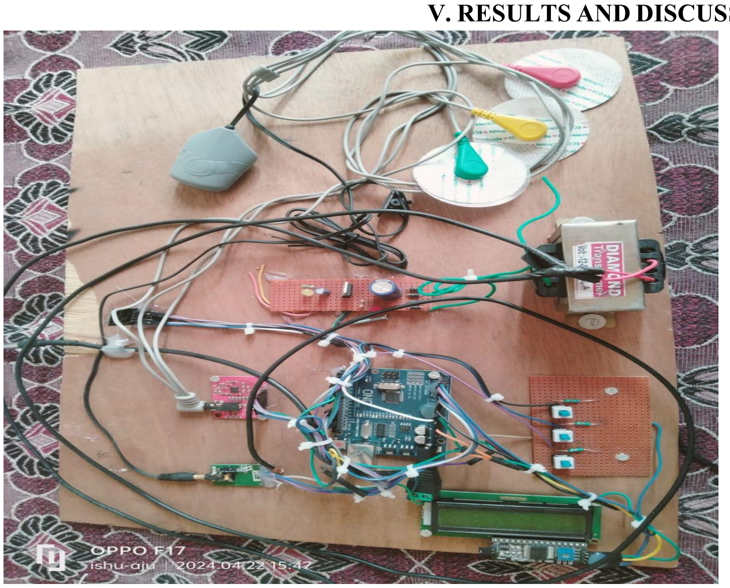
- Repeat the main loop to continuously monitor, display, and transmit data.

6) Termination

- If the system is to be turned off or terminated, exit the main loop.
- Close connections and release resources.

7) End the program.

V. RESULTS AND DISCUSSION



VI. CONCLUSION

To sum up, the healthcare monitoring system project signifies a substantial leap forward in the domain of health tracking and early identification. Through the amalgamation of cutting-edge technology, instantaneous monitoring capabilities, and seamless integration with cloud platforms, the system provides individuals and healthcare experts with the tools necessary to make well-grounded judgments concerning health maintenance. Its broad range of applications spans from personal wellness initiatives to the management of chronic illnesses, remote monitoring of patients, and advancements in sports medicine. Overall, it holds the potential to usher in a future marked by improved health outcomes and heightened awareness.

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